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| 10/814,714 | 03/31/2004 | Heinz H. Busta | 100067 | 9863 |

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| EXAMINER |
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VIJAYAKUMAR, KALLAMBELLA M

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| ART UNIT | PAPER NUMBER |
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1793

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01/10/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/814,714

Applicant(s)

BUSTA ET AL.

Examiner

Kallambella Vijayakumar

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 October 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4,6-8,12-16,18,21,22 and 25-35 is/are pending in the application.
- 4a) Of the above claim(s) 29-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 4, 6, 7, 8, 12-16, 18, 21-22 and 25-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Applicants arguments filed with the amendment filed 10/19/2007 have been entered. Claims 1, 4, 6, 7, 8, 12-16, 18, 21-22 and 25-28 were amended. Claims 2-3, 9-11, 17, 19-20, 23-24 and 36 cancelled. Claims 1, 4, 6, 7, 8, 12-16, 18, 21-22 and 25-35 as amended are currently pending with the application. Claims 29-35 have been withdrawn from further consideration.

Applicants amendment overcomes the rejections under 35 USC 112-II paragraph and the rejections over Fujii et al (US 5,547,609) cited in the last office action.

Claim Objections

Claim 22 objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The instant claim recites the limitation of "a non-photoresist" that is not further limiting the resins/media in claim-18.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claims 1, 4, 6-8 and 12-16 rejected under 35 U.S.C. 103(a) as being unpatentable over Tuck (WO 02/03413).

The US 2004/0025732 is being used as the equivalent of WO 02/03413 in the present rejection.

Tuck et al teach a field emission device containing an array of field electron emitters formed by printing an ink containing: (i). A plurality of first particles such as Graphite; (ii). A plurality of second particles such as **carbon black**, (iii). An insulating material such as amorphous **silica or ormosil**; (iv). A binder such as PVA/cellulose derivatives dispersed in a solvent or **methacrylate polymers** dissolved in solvents; and (v). A dispersing agent comprising modified **polyurethane** in butyl acetate or modified **polyacrylate** in methoxypropanol (Para 0106, 0016-0024, 0039-0040; 0056-0070; 0078, 0089, 0163, 0164) and making the device by screen printing the ink over a conductive surface forming a field emitter (Para 0022). The prior art teaches making an ink by mixing the components that are either same or substantially same as that claimed by the applicants, and coating the ink over a conductive substrate by spin coating, followed by drying/curing (Para, 0022, 0067, 0145, 0153; 0283-0287) thus forming a field emitter over a conductive substrate that is either porous or planar surface. With regard to a carbon black obtained by a specific process, the examiner asserts that prior art composition containing the carbon black will either be same or substantially same as that claimed by the applicants.

The prior art fails to teach the instant claimed viscosity per claims 1 and 6.

It would have been obvious to a person of ordinary skilled in the art to optimize the viscosity of the ink composition of Tuck as a choice of design of the chosen printing means by routine experimentation with reasonable expectation of success, because the prior art teaches the printing of the ink by various printing means a process that places an ink in a defined pattern such as screen printing, Xerography, photolithography, electrostatic deposition, spraying, ink jet printing and offset lithography Para [0022] and spin coating (P-0123, 0145) and adjusting the flow properties and viscosity of the ink (P-0204). Further carbon inks for ink-jet printing have low viscosities (See Belmont et al, US 5,571,311, CI-11, Table). Generally, differences in concentration or temperature or viscosity will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature or viscosity is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

With regard to claim -4, the prior art teaches ink-jet printing the ink over a conductive surface forming a field emitter (Para 0022). Further carbon inks for ink-jet printing have low viscosities (See Belmont et al, US 5,571,311, CI-11, Table).

With regard to claim-7, the prior art composition and its components are that are either same or substantially same as that by the applicants, and the examiner asserts that the art composition will be either be same or substantially same as that made using the composition having specific properties and containing the components that are not an essential part of the composition as claimed.

With regard to claims 8, prior art composition is either be same or substantially same as that claimed by the applicants, and similar compositions are expected to possess similar properties.

With regard to claim 12-15, the prior art teaches a field emitter formed over a porous or planar surface (Para 0089, 0113), and the examiner asserts that the prior art composition and structure will be that are either same or substantially same as that formed by the instant claimed process step in claim-14.

With regard to claim 16, the prior art teaches PMMA <photoresist and diamond precursor> (See, Hiroka et al, CI-1, Ln 56-67; CI-2, Ln 31-41; and Tang et al US 2004/0245910, Para 0056).

2. Claims 1, 4, 6-8 and 12-16 are rejected under 35 U.S.C. 103(a) as obvious over Tuck (WO 02/03413) in view of Blanchet-Fincher et al (US 5,948,465).

The US 2004/0025732 is being used as the equivalent of WO 02/03413 in the present rejection.

Tuck et al teach a field emission device containing an array of field electron emitters formed by printing an ink containing: (i). A plurality of first particles such as Graphite; (ii). A plurality of second particles such as **carbon black**, (iii). An insulating material such as amorphous **silica or ormosil**; (iv). A binder such as PVA/cellulose derivatives dispersed in a solvent or **methacrylate polymers** dissolved in solvents; and (v). A dispersing agent comprising modified **polyurethane** in butyl acetate or modified **polyacrylate** in methoxypropanol (Para 0106, 0016-0024, 0039-0040; 0056-0070; 0078, 0089, 0163, 0164) and making the device by screen printing the ink over a conductive surface forming a field emitter (Para 0022). The prior art teaches making an ink by **mixing** the components that are either same or substantially same as that claimed by the applicants, and coating the ink over a conductive substrate by spin coating, followed by drying/**curing** (Para, 0022, 0067, 0145, 0153; 0283-0287) thus forming a field emitter over a conductive substrate that is either porous or planar surface. With regard to a carbon black obtained by a specific process, the examiner asserts that prior art composition containing the carbon black will either be same or substantially same as that claimed by the applicants.

The prior art is silent about the source of carbon black per the claim-1, and viscosities per claims 1 and 6.

In the analogous art, Blanchet-Fincher et al teach carbon emitters comprising powders of graphite, micronized coke, polycrystalline diamond and carbon soot dispersed in a binder (Col-2, Ln 32-36) and measuring the field emitter properties as a function of applied voltage (Col-6, Ln 38-47).

It would have been obvious to a person of ordinary skill in the art to substitute the carbon black in the composition of Tuck with carbon black obtained from other sources including carbon soot or particulate from oils as functional equivalent with reasonable expectation of success, because carbonaceous electron emitters were well known in the art at the time of disclosure of the invention by the applicants as shown by the teachings of Blanchet-Fincher. Further, It would have been obvious to a

person of ordinary skilled in the art to optimize the viscosity of the ink composition of Tuck as a choice of design of the chosen printing means by routine experimentation with reasonable expectation of success, because the prior art teaches the printing of the ink by various printing means a process that places an ink in a defined pattern such as screen printing, Xerography, photolithography, electrostatic deposition, spraying, ink jet printing and offset lithography Para [0022] and spin coating (P-0123, 0145) and adjusting the flow properties and viscosity of the ink (P-0204). Further carbon inks for ink-jet printing have low viscosities (See Belmont et al, US 5,571,311, CI-11, Table). Generally, differences in concentration or temperature or viscosity will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature or viscosity is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

With regard to claim -4, the prior art teaches ink-jet printing the ink over a conductive surface forming a field emitter (Para 0022). Further carbon inks for ink-jet printing have low viscosities (See Belmont et al, US 5,571,311, CI-11, Table).

With regard to claim 7, the prior art composition and its components are similar to that by the applicants, and the examiner asserts that the art composition will be similar to that made using the composition having specific properties and containing the components that are not an essential part of the composition as claimed.

With regard to claim 8, prior art composition is similar to that claimed by the applicants, and similar compositions are expected to possess similar properties.

With regard to claims 12-15, the prior art teaches a field emitter formed over a porous or planar surface (Para 0089, 0113), and the examiner asserts that the prior art composition and structure will be similar to that formed by the instant claimed process step in claim-14.

With regard to claim 16, the prior art teaches PMMA <photolith and diamond precursor> (See, Hiroka et al, CI-1, Ln 56-67; CI-2, Ln 31-41; and Tang et al US 20040245910, Para 0056).

3. Claims 18, 21-22 and 25-28 are rejected under 35 U.S.C. 103(a) as being obvious over Tuck (WO 02/03413) in view of Blanchet-Fincher et al (US 5,948,465).

The disclosure on the composition and method of making the composition by Tuck et al as set forth in rejection-1 under 35 USC 103(a) is herein incorporated.

Tuck fails to teach the measuring the field emitter properties per claim-18.

In the analogous art, Blanchet-Fincher et al teach carbon emitters comprising powders of graphite, micronized coke, polycrystalline diamond and carbon soot dispersed in a binder (Col-2, Ln 32-36) and measuring the field emitter properties as a function of applied voltage (Col-6, Ln 38-47).

It would be obvious to a person of ordinary skill in the art to measure various process parameters and properties including the vertical resistances of the field emitter during the process of making the composition as routine quality control function of the process control to optimize the process steps with reasonable expectation of success because the measurements of emitter properties was well known at the time of disclosure of the invention by the applicants as evidenced by measuring Field-Emitter characteristics by Fincher et al.

With regard to claim 21, the prior art teaches methacrylate polymers <photoresist> (See Angelo et al, US 4,376,057; Cl-2, Ln 7-10).

With regard to claim 22, the prior art teaches polyurethane.

With regard to claims 25-28, the prior art teaches making a field emitter over a conductive substrate that is either porous or planar surface (Para 0089, 0113).

4. Claims 1, 4, 6-8, 12-15, 18, 22 and 25-28 rejected under 35 U.S.C. 103(a) as obvious over Ma et al (US 2005/0224764) in view of Tuck (WO 02/03413) and Blanchet-Fincher et al (US 5,948,465).

Ma et al teach the composition of an electroconductive ink comprising: (i). Carbon fibrils; (ii). **Carbon black**; (iii). A binder comprising polyurethane, polyester, polyacrylic acid, epoxy; and (iv). A solvent such as butyl carbitol (Abstract, Para 0051, 0110, 0113, 0115, 0119). The prior art teaches making the ink with a viscosity of **1 to 50,000 cps** by mixing the components (0052). The prior art further teaches forming a

field emitter by depositing the ink over an Al-foil forming a pattern of squares and curing it (Para 0178) and further teaches measuring the emitter properties (Para 0178-0179).

The prior art fails to teach the addition of silica particles in the composition per claims 1 and 18, and measuring the vertical resistance per the claim-18. However, the prior art teaches the criticality of viscosity and the addition of rheology modifiers in the composition, and printing the composition by screen printing (Para 0007, 0068 and 0075; Table-2).

In the analogous art, Tuck et al teach the addition of fumed silica to control the rheology of carbon based inks for Field electron emission devices that could be printed by screen printing (Title, Abstract, Para 0152, 0022).

In the analogous art, Blanchet-Fincher et al teach carbon emitters comprising powders of graphite, micronized coke, polycrystalline diamond and **carbon soot** dispersed in a binder (Col-2, Ln 32-36) and measuring the filed emitter properties as a function of applied voltage (Col-6, Ln 38-47).

It would have been obvious to a person of ordinary skilled in the art to include fumed silica rheology modifiers in the ink composition of Ma et al to benefit from improved rheology of the ink with reasonable expectation of success, because the Ma et al is suggestive of incorporating rheology modifiers. Also, It would have been obvious to a person of ordinary skilled in the art to substitute the carbon black in the composition of Tuck with carbon black obtained from other sources including carbon soot or particulate from oils as functional equivalent with reasonable expectation of success, because carbonaceous electron emitters were well known in the art at the time of disclosure of the invention by the applicants as shown by the teachings of Blanchet-Fincher. Further, It would be obvious to a person of ordinary skill in the art to measure various process parameters and properties including the vertical resistances of the filed emitter during the process of making the composition as routine quality control function of the process control to optimize the process steps with reasonable expectation of success because the measurements of emitter properties was well known at the time of disclosure of the invention by the applicants as evidenced by measuring Field-Emitter characteristics by Fincher et al, and because the Ma et al teaches measuring the resistances of the Field Emissive Coating (Para 0136).

With regard to claims 4 and 12-15, the combined prior art further teaches forming a field emitter by depositing the ink over an Al-foil forming a pattern of squares and curing it (Para 0178), and structure will be similar to that formed by the instant claimed process step in claim-14.

With regard to claim 7, the combined prior art composition and its components are similar to that by the applicants, and the examiner asserts that the art composition will be similar to that made using the composition having specific properties and containing the components that are not an essential part of the composition as claimed.

With regard to claim 8, prior art composition is similar to that claimed by the applicants, and similar compositions are expected to possess similar properties.

With regard to claims 22 and 25-28, the prior art teaches mixing the components, coating a conductive substrate including planar, wire and flexible stainless steel screen, and drying the coated film forming the field emitter wherein the art components and the process steps are similar to that by the applicants (Col-2, Ln 13-31; Col-3, Ln 53-Col-4, Ln 9; Col-5, Ln 36-40; Col-6, Ln 37-40; Col-7, Example-1).

Response to Arguments

Applicant's response filed 10/19/2007 have been fully considered. Applicant's amendment fails to overcome the objection to claim-22 for the reasons set forth above.

Applicants are correct in the argument the argument that Tuck et al does not teach the claimed viscosity per claim-1 (Res, Pg-7, Para-4; Pg-9, Para-2), but the it would be obvious over the methods of disposing the composition including ink-jet process and for the reasons set forth in the rejections cited above. With regard to the Applicant's argument that "Blanchet-Fincher reference is not suggestive of the process step because they do not measure vertical resistance or teach evaluating the formulation to see if the formulation has reached a particular desired conductivity threshold," (Res, Pg-10, Para-1) the prior art teaches measuring the characteristics of the cured Filed emitter product, and quality control of a process by measuring various parameters including the vertical resistances would have been obvious to

a person of ordinary skilled in the art. With regard to the argument that Ma et al state "(c)ommercially available electroconductive inks which contain carbon black for example, cannot emit electrons and thus cannot be used in field emission devices." (Para-0079), the prior art teaches the addition of carbon black in the ink composition (Para-0119; 0128) and not limited to the commercial inks as argued. In response to applicant's argument that Ma et al. teaches adding carbon black as a filler and teaches away from using carbon black as the field emitter (Res, P-11, Para-1), the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). With regard to the argument that he Ma et al reference teaches polymeric binders for changing the rheology of the inks one of skill in the art would not be motivated to silica as a rheological modifier (Res, Pg-11, Para-1), the prior art teaches addition of the rheology modifiers (Para-0068) and the disclosure is not limited to the specific examples taught by the prior art and the addition of silica as rheology modifier was well known in the art (See Tuck et al, Para-0152) at the time of disclosure of the invention by the applicants.

For the reasons set forth above, applicant's fail to patentably distinguish their composition and process over the prior art.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

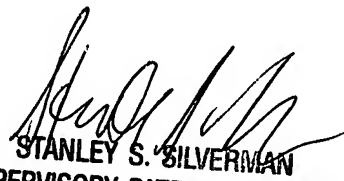
the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kallambella Vijayakumar whose telephone number is 571-272-1324. The examiner can normally be reached on 6.30-4.00 Mon-Thu, 6.30-2.00 Alt Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/KMV/
January 2003, 2008.


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